

EFFECT OF ESSENTIAL AMINO ACID SUPPLEMENTATION OF CASEIN AND SARDINE POWDER ON THE PROTEIN REQUIREMENTS OF THE PRAWN, *PENAEUS JAPONICUS*

Protein requirements of the prawn *Penaeus japonicus* has been extensively studied using purified diets based on casein (Deshimaru and Yone, 1978; Teshima and Kanazawa, 1984), but little work has been done on the essential amino acid balance required by prawn. Application of information on protein requirements to commercial practice will require an understanding of the effects of amino acid balance in the diet on growth. The present study investigates the effects on prawn growth of supplementing sardine powder and casein with essential amino acids.

Material and Methods

Seven purified diets containing varying levels of sardine powder, casein and crystalline amino acids were prepared. Diet 1 (control) contained 50% casein and a total of 53% amino acid. Diets 2, 3 and 4 contained 40, 35 and 30% casein, and this was adjusted to 50, 45 and 40% total amino acid respectively using essential amino acids. Diets 5, 6 and 7 contained 50, 45 and 40% sardine powder and were adjusted to 50, 45 and 40% total amino acid respectively. Amino acids were added individually to adjust the essential amino acid profile of the diet to that of a standard diet based on the composition of prawn muscle. All diets contained 8% gluten-M and 3% CMC as binders. There were two replicates.

Twenty juvenile prawns of 0.41–0.52g body weight were placed in 30L tanks with a recirculating salt water system. Water was maintained at $25 \pm 1^\circ\text{C}$ and aerated continuously. Prawns were fed twice daily with a dry diet at 5–10% of body weight.

Results and Conclusion

Weight gain was increased ($P < 0.05$) by supplementing the casein with essential amino acids (0.28g, 0.38g and 0.44g in

groups 4, 3 and 2 respectively), and by the lowest level of supplementation of sardine powder (0.36g) (Table 1). With the lower levels of sardine powder weight gain (0.20g) was less than for the control diet (0.27g).

Food efficiency ratio was higher with the high level of amino acid supplemented diets, 0.27 in diet 2 and 0.25 in diets 3 and 5. Results showed a linear increase in the food efficiency ratio with level of total amino acids ($r = 0.98$ and 0.97 in casein and sardine powder groups respectively).

Protein efficiency ratios were increased by amino acid supplementation and were higher for diets based on casein (0.44, 0.48, 0.44 in groups 2, 3 and 4) than for those based on sardine powder (0.41, 0.29 and 0.20 in groups 5, 6 and 7).

We conclude that growth was higher on casein than on sardine powder based diets. Addition of essential amino acid to diets containing casein and sardine powder increased the weight gain of prawns. The addition of essential amino acid improved the quality of the diet as measured by the food and protein efficiency ratios.

Literature Cited

- Deshimaru, O. and Yone, Y. 1978. Optimum level of dietary protein requirement for prawn. Bulletin of Japanese Society of Scientific Fisheries **44**(12): 1395–1397.
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H.Z. Sarac, Queensland Department of Primary Industries, Bribie Island Aquaculture Research Centre, P.O. Box 191, Bribie Island, Queensland 4507, Australia.

A. Kanazawa, Kagoshima University, Faculty of Fisheries, Shimoarata, 4-50-20, Kagoshima 890 Japan.

TABLE 1. Weight gain, food intake, food efficiency and protein efficiency ratio of the prawn, *Penaeus japonicus* as affected by protein source and essential amino acid level.

Base Protein	Diet Intake (g/prawn)	Increase in Body (g)	Food Efficiency	Protein Efficiency Ratio
Casein				
1(Control)	1.54	0.27	0.17	0.33
2	1.62	0.44	0.27	0.44
3	1.57	0.38	0.25	0.48
4	1.40	0.28	0.20	0.44
Sardine Powder				
5	1.46	0.36	0.25	0.41
6	1.54	0.25	0.16	0.29
7	1.68	0.20	0.12	0.20